

REMARKS

Claim 61 is objected to as being a substantial duplicate of Claim 55. Claim 61 has been cancelled.

Claims 1-3, 7, 10, 16, 17, 22, 25, 33, 51 and 56 are rejected under 35 U.S.C. 102b as being anticipated by U.S. Patent 5,808,742 to Everett et al. The rejection is respectfully traversed as applied to the claims as amended.

Claims 1 and 16 have been amended to clarify that the image of the portion(s) of one of the two structures is substantially distinct from the image of the portion(s) of the remaining one of the two structures. As amended, the invention of Claims 1 and 16 distinguish over Everett.

As clearly explained in Column 1, Lines 33-46 of Everett, the device proposed by Everett is for determining the misalignment between an alignment mark on the first plate (such as a mask) and that on the second plate (such as a substrate) where the two gratings have slightly different pitches. The two gratings on the two plates overlap each other so that the light illuminating the gratings produce overlapping diffracted beams that create discernable interference patterns known as moiré patterns such as those shown in Figs. 9 and 10 of Everett. Fig. 8 of Everett illustrates arrangement of alignment mark pairs of the mask and substrate. In order to measure the alignment between the mask and substrate, the alignment mark pairs 70 is superimposed on the alignment mark pairs 60. Where the alignment marks of Fig. 8 are correctly superimposed, the fringe patterns 201 form a partnership of counter-moving fringes, and fringe patterns 202 form a second partnership of counter-moving fringes. Fig. 9 illustrates the fringe interference patterns 201 and 202 when the alignment marks of Fig. 8 are correctly superimposed or aligned. When the mask and substrate are shifted relative to each other in a direction perpendicular to the lines of the grating pairs, fringes 201 counter-moves to form fringe pattern 301. The offset indicates the misalignment between the mask and the substrate. In addition, independent fringe partnership 202 has counter-moved by a different phase offset to form the fringe pattern 302, yielding an independent measurement of the misalignment. Therefore, by examining the fringe interference patterns such as those shown in Figs. 9

and 10, misalignment between the mask and the substrate can be determined. See Column 7, lines 16-37 of Everett.

From the above, it is evident that Everett's system requires superposition of the two alignment marks such as alignment marks 70 and 60 shown in Fig. 8 of Everett so that the images of the two marks detected are not distinct from each other. Instead the diffracted light from the images alignment marks 70 and 60 will interfere to form moiré patterns. In the invention of Claims 1 and 16, however, the image formed of the portion(s) of one of the two structures is substantially distinct from the image formed of the portion(s) of the remaining one of the two structures. As illustrated in one embodiment of the invention, the two periodic structures are placed side-by-side so that they do not overlap substantially and radiation diffracted from the two periodic structures do not interfere to form interference patterns. This is disclosed, for example, on Page 10, Line 19 and in Fig. 9 of the present application. In such embodiment, the images of the two structures, as well as portions thereof, are distinct from each other, unlike the interference fringe patterns of Everett. Thus, in the invention of Claims 1 and 16, distinct images of portions of the two structures are first formed on the array of detectors. Then subsequently, mis-alignment between the structures is then determined from the images so formed on the array of detectors. This is very different from Everett, where distinct images of the two alignment marks on the mask and substrate are not formed. Instead, the two alignment marks are superimposed upon each other and Everett relies on the interference between beams diffracted from the overlapping gratings in order to determine the misalignment between the alignment marks.

It is believed to be well settled that in order for a reference to anticipate a claim under 35 U.S.C. 102b, there must be identity of elements between those of the reference and those of the claim. Everett clearly fails this test because in order for Everett's device to operate, the images formed of portions of one of the two erratic structures cannot be distinct from the image formed of portions of the remaining one of the two structures. There is, therefore, no identity of elements between Everett and the invention of Claims 1 and 16. Furthermore, in view of the very different operating principles in the invention of Claims 1 and 16 on one hand and those of Everett on the other, it is believed that

Claims 1 and 16 are also non-obvious over Everett. Claims 1 and 16 are, therefore, believed to be allowable.

As for Claim 2, while Everett also measures phase difference, this phase difference manifests itself as the shape of an interference pattern or moiré pattern, rather than phase difference between outputs of detectors. Instead of relying on the phase difference between outputs of detectors in order to determine misalignment as in Claim 2, Everett adjusts the relative positions of the mask and the substrate until the detector detects a particular interference pattern or moiré pattern. We, therefore, disagree with the examiner's reasoning in regard to Claim 2 on Page 3 of the office action. Therefore, Claim 2 is believed to be allowable since it depends from allowable Claim 1, and further on the ground of the limitation added in Claim 2. Claims 3, 10, 18, 25 and 33 are believed to be allowable since they depend from allowable Claims 1 and 16. Claims 7, 17, 22, 25 are believed to be allowable since they depend from allowable claims. For substantially the same reasons as those explained above in Claims 1 and 16, Claim 51 is also believed to be allowable. Claim 56 is believed to be allowable since it depends from allowable Claim 51.

Claims 13, 15, 34 and 36 are rejected under 35 U.S.C. 102b as being anticipated by U.S. Patent 5,333,050 to Nose et al. Claims 13 and 34 have been cancelled and Claims 15 and 36 have been amended to depend from Claims 14 and 35 instead. Claims 14 and 35 are believed to distinguish over Nose since Nose fails to teach or suggest the causing of relative motion between the apertures and detectors so that these two claims are believed to be patentable over Nose. Claims 15 and 36 have been amended to clarify that the two structures are at different distances from the optics so that these two claims also add limitations which are not taught or suggested by Nose. As clearly stated in Column 3, Lines 4-6 of Nose, the two diffraction gratings A and B in Fig. 2 are placed on the same plane and are, therefore, at the same distance relative to the optics in Fig. 37 of Nose. When the two diffracting gratings are at the same distance to the optics, the depth of focus is not a problem. This is not the case in Claims 15 and 36, where the two structures are at different distances from the optics. In such event, the two apertures are located so that the image of each of the two structures is focused by the same optics substantially to the corresponding aperture. Nose clearly fails to teach or suggest such

feature. Therefore, Claims 15 and 36 are believed to be allowable since they depend from allowable Claims 14 and 35, and further on the ground of the limitations added in these Claims.

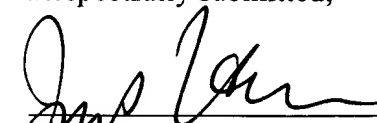
Claims 4, 5, 11, 12, 19, 20, 26, 32, 62 and 63 are believed to be allowable since they depend from allowable claims. The same is true for Claim 27. As for claims 28-30, 38, 39, 46, 47 and 52-54, the examiner rejected these claims without giving any support for the rejection. The examiner therefore has failed to provide a *prima facie* case of obviousness with respect to these claims. Furthermore, since Everett contemplates that his device uses x-rays (e.g. see Col. 5, lines 21-25), the numerical aperture is typically not an important issue for the device to have a large depth of focus (in view of the large gap between the mask and the substrate), unlike the invention in the rejected claims. Therefore, contrary to the reasoning of the examiner, it would not be obvious to one skilled in the art to adopt the values for the numerical aperture in the rejected claims in view of Everett. These claims are thus believed to be allowable since they depend from allowable Claims, and further on the ground of the limitations added in these Claims.

It is noted with appreciation that Claims 48-50 are allowed and that Claims 6, 8, 9, 14, 21, 23, 24, 31, 35, 41-44 and 57-60 are objected to. Even though not specifically stated in the office action, it is assumed that these claims would be allowable if written in independent form, including all of the limitations of the claims upon which they depend. This has been done for Claims 14 and 35 and these two claims are, therefore, believed to be allowable. The remaining dependent claims have not been so rewritten since the claims upon which they depend are also believed to be allowable.

Claims 1-12, 14-33, 35-60 and 62-63 are presently pending in the application. Reconsideration of your rejections is respectfully requested and an early indication of the allowability of all the claims is earnestly solicited.

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Respectfully submitted,



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